

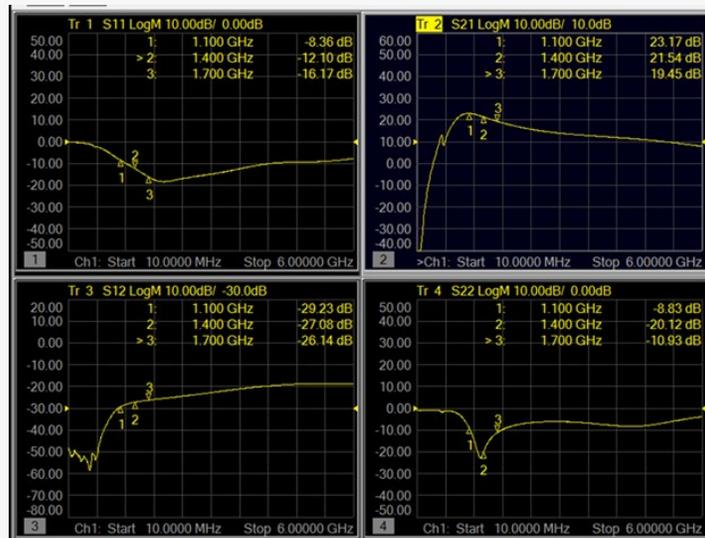


What Is the Best LNA for Your GPS Receiver?

The Global Positioning System (GPS) has become an integral part of our modern world, providing precise navigation information for applications such as cellular, automotive, military, surveying, and wearable electronics.

For those GPS applications demanding the absolute lowest noise amplifier performance, Guerrilla RF offers [GRF2071](#) and its automotive-qualified variant [GRF2071W](#). These devices deliver an industry-leading combination of noise figure (NF), gain, linearity and bandwidth.

The vector network analyzer (VNA) screen shot shows s-parameter performance of the [GRF2071 / 2071W](#) evaluation board with a tune bandwidth that exceeds the full range of GPS frequencies defined by L5 at 1176.45 MHz and L1 at 1575.42 MHz.



The table below highlights the measured evaluation board performance with the L1 to L5 tune.

Device	Freq MHz	Vdd	Iddq mA	Gain dB	IIP3 dBm	OIP3 dBm	IP1dB dBm	OP1dB dBm	EVB NF dB
GRF2071	1100	5.0	61.4	22.9	12.4	35.3	-5.4	16.5	0.39
GRF2071	1200	5.0	61.4	22.7	13.9	36.6	-4.9	16.7	0.39
GRF2071	1300	5.0	61.4	22.2	14.6	36.9	-4.3	16.9	0.39
GRF2071	1400	5.0	61.5	21.7	16.0	37.7	-3.2	17.5	0.38
GRF2071	1500	5.0	61.6	21.0	17.1	38.2	-1.8	18.2	0.38
GRF2071	1600	5.0	61.6	20.3	18.6	38.9	-0.6	18.7	0.38
GRF2071	1700	5.0	61.6	19.6	19.9	39.5	0.7	19.3	0.38

Here are the main takeaways:

NF: Note that the extremely low NF values of 0.38 to 0.39 dB include the small losses (roughly 0.05 dB) associated with the evaluation board input SMA connector. De-embedded NF values are thus in the 0.34 dB range, making this the industry's lowest NF solution for this band.

Gain: The gain values in the 20 to 22.5 range combine with the ultra-low NF to enable GPS receivers with the absolute lowest possible cascaded NF. Furthermore, the application schematic and matching values were also chosen to ensure unconditional stability.

Biasing: Biasing for most of Guerrilla RF's pHEMT devices is extremely flexible, and [GRF2071](#) / [2071W](#) are no exception. Vdd can range from 2.7 to 5.0 volts with essentially no change to the device gain or NF. The device quiescent current (Iddq) can be adjusted over a typical range of 20 to 80 mA with only minimal NF degradation as the device current drops below 35 mA. Note that the device 1 dB compression point (P1dB) is more closely tied to Vdd than to Iddq, while just the opposite is true for the third-order intercept (IP3) performance.

Matching: The [GRF2071](#) / [2071W](#) matching performance shown in the VNA screen shot was achieved on the standard evaluation board with only nine external passive components. While care must be taken to ensure that the components on the LNA input are high-Q to optimize NF performance, the Guerrilla RF applications team achieves excellent results using low-cost GJM-series capacitors and LQG-series inductors from Murata with comparable substitutions posing no performance issues.

[GRF2071](#) / [2071W](#) are in full production using our standard 2.0 x 2.0 mm DFN-6 plastic package. Tuned evaluation boards and samples are available now.

Regardless of your technical requirements, Guerrilla RF is committed to providing the high performance RF solutions and applications support

necessary to make your product a success.

Contact us at applications@guerrilla-rf.com or sales@guerrilla-rf.com!



Guerrilla Search™